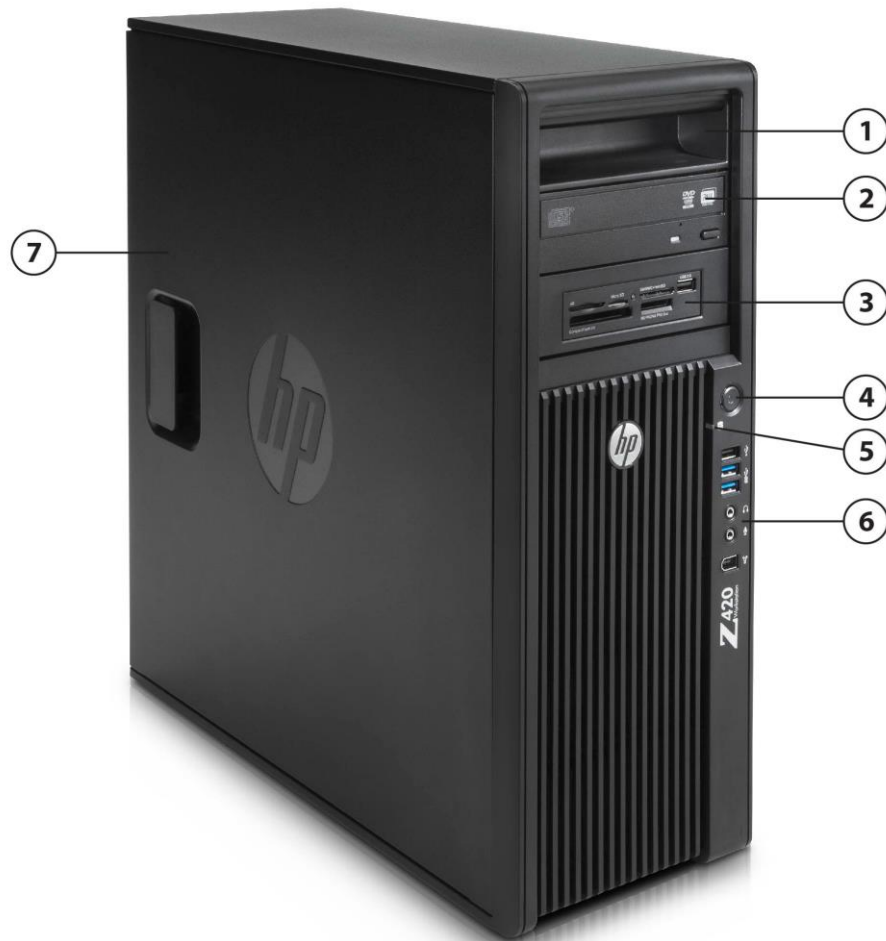


Overview

HP Z420 Workstation



1. Handle in Top Optical Bay (optional)
2. 3 External 5.25" Bays
3. 14-in-1 Media Card Reader (optional)
4. Power Button
5. HDD Activity LED
6. Front I/O: 1 USB 2.0, 2 USB 3.0, 1 Headphone, 1 Microphone, 1 1394a
7. Easy-open Side Panel

Overview



8. 3 External 5.25" Bays
9. 3 Internal 3.5" Bays
10. 8 DIMM Slots for DDR3 ECC Memory
11. 600W, 90% Efficient Power Supply or 400W, 90% Efficient Power Supply
12. Rear I/O: Rear Power Button & LED, PS/2 Ports, 1 1394a, 4 USB 2.0, 2 USB 3.0, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out, 1 Microphone
13. Intel Xeon Processors: E5-1600 family (4C), E5-1600v2 family (4C/6C/8C), E5-2600v2 (8C)
14. 2 PCIe x16 Gen3 Slots
15. 1 PCIe x8 Gen3, 1 PCIe x8(x4) Gen2, 1 PCIe x4(x1) Gen2, 1 PCI Slot
16. 6 Internal USB 2.0 Ports
17. 6 SATA Ports

Form Factor	Convertible Minitower
Operating Systems	Preinstalled: <ul style="list-style-type: none">Windows 7 Ultimate 64-BitWindows 7 Professional 32/64Windows 8.1 Pro 64-bitWindows 8.1 Simplified Chinese Edition 64-bitWindows 8.1 Pro Downgrade to Windows 7 Professional 32/64SUSE Linux Enterprise Desktop 11 (90 day support)

Overview

- Red Hat Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS)
- Windows 8.1 Simplified Chinese Edition 64-bit
- Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit
- Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit
- HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 5 & 6 and SUSE Linux Enterprise Desktop 11)

Supported:

- Windows 8/8.1 Enterprise 64-bit
- Windows 7 Enterprise 32/64-bit
- Windows® XP Professional 32/64 (on select configurations)*

Notes: *See the "Windows XP Support Matrix for Z Workstations" at:
http://www.hp.com/support/workstation_manuals

Notes: For detailed OS/hardware support information for Linux, see:
http://www.hp.com/support/linux_hardware_matrix

Available Processors

Name	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MHz)	QPI Speed (GT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology ¹	TDP (W)
Intel® Xeon® E5-1680 v2 processor	8	3.0	25	1866	-	Y	Y	4, 9	130
Intel Xeon E5-2650 v2 processor	8	2.6	20	1866	8.0	Y	Y	4, 8	95
Intel Xeon E5-1660 v2 processor	6	3.7	15	1866	-	Y	Y	2, 3	130
Intel Xeon E5-1650 v2 processor	6	3.5	12	1866	-	Y	Y	1, 4	130
Intel Xeon E5-1620 v2 processor	4	3.7	10	1866	-	Y	Y	0, 2	130
Intel Xeon E5-1607 v2 processor	4	3.0	10	1600	-	N	Y	N/A	130
Intel Xeon E5-1620 processor	4	3.6	10	1600	-	Y	Y	2, 3	130
Intel Xeon E5-1603 processor	4	2.8	10	1066	-	N	Y	N/A	130

¹The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

NOTE: Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z420 Workstation does not support dual processor configurations.

Available Processor Disclaimers

Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.

64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS,

Overview

	<p>operating system, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information.</p> <p>Quad-Core, Six-Core, and Eight-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits. Check with software provider to determine suitability. Not all customers or software applications will necessarily benefit from use of these technologies.</p>
Color	Jack Black
Convertibility	Yes. 5.25" drives rotate for Minitower or Desktop orientation.
Expansion Slots (see system board section for more details)	<p>Slot 1 (top): PCI Express Gen2 x4(1)* Full-height, Full-length</p> <p>Slot 2: PCI Express Gen3 x 16 Full-height, Full-length (with extender)</p> <p>Slot 3: PCI Express Gen2 x 8(4)* with open-ended connector** Full-height, Full-length (with extender)</p> <p>Slot 4: PCI Express Gen3 x8 with open-ended connector** Full-height, Full-length (with extender)</p> <p>Slot 5: PCI Express Gen3 x16 Full-height, Full-length (with extender)</p> <p>Slot 6: PCI 32bit/33MHz Full-height, Full-length (with extender)</p> <p>* x<number> = number of lanes or size of the physical/mechanical connector. (number) = number of lanes supported electrically. Typically communicated as x# mechanical, x(#)electrical.</p> <p>** open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.</p>
Expansion Bays (see storage section for more details)	<p>3 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed) 3 external 5.25" bays (4th HDD occupies one external bay)</p> <p>Top and Middle 5.25" bay device depth limit: 206mm (8.11 inches)</p> <p>Bottom 5.25" bay device depth limit: 173mm (6.81 inches)</p>
Front I/O	2 USB 3.0, 1 USB 2.0, 1 IEEE 1394a standard, 1 Headphone, 1 Microphone
Internal I/O	USB 2.0 ports available by three separate 2x5 headers. Each 2x5 header supports either one HP Internal USB Port Kit (EM165AA) or one 14-in-1 Media Card Reader.
Rear I/O	2 USB 3.0, 4 USB 2.0, 1 IEEE 1394a port, 2 PS/2, RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out, 1 Microphone.

Overview

	Serial supported with optional connector on PCI bracket cabled to system board connector	
Interfaces Supported	14-in-1 Media Card Reader (optional) 6-channel SATA interface (2 @ 6.0 Gb/s, 4 @ 3.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported). USB 2.0, USB 3.0, IEEE 1394a interface	
Chassis Dimensions (HxWxD)	Standard minitower orientation: 44.76 x 17.78 x 44.52 cm (17.6 x 7.0 x 17.5 in) Converted desktop orientation: 17.9 x 44.76 x 44.52 cm (7.0 x 17.6 x 17.5 in)	
Weight	Exact weights depend upon configuration. Minimum: 12.5kg (27.5 lbs) Standard: 13.2kg (29.2 lbs) Maximum: 17.7kg (39 lbs)	
Temperature	Operating:	5° to 35°C (40° to 95°F)
	Non-operating	-40° to 60°C (-40° to 140°F)
Humidity	Operating:	8% to 85% relative humidity, non-condensing
	Non-operating	8% to 90% relative humidity, non-condensing
Maximum Altitude (non-pressurized)	Operating:	3,048m (10,000ft)
	Non-operating	9,144m (30,000ft)
Power Supply	600 watts wide-ranging, active Power Factor Correction, 90% Efficient The Z420 600W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT_PACKARD_623193-001_ECOS_2619_1_600W_Report.pdf (optional) 400 watts wide-ranging, active Power Factor Correction, 90% Efficient The Z420 400W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/DELTA%20ELECTRONICS_DPS-400AB-3%20A_ECOS%202277_400W_Report.pdf	
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html	

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel Xeon E5-1600 Series				
Intel® Xeon® Processor E5-1620 4C 3.60GHz	Y	N		
Intel® Xeon® Processor E5-1603 4C 2.80GHz	Y	N		
Intel Xeon E5-2600 v2 Series - CTO				
Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz	Y	N		
Intel Xeon E5-1600 v2 Series				
Intel® Xeon® Processor E5-1680 v2 8C 3.00GHz	Y	N		
Intel® Xeon® Processor E5-1660 v2 6C 3.70GHz	Y	N		
Intel® Xeon® Processor E5-1650 v2 6C 3.50GHz	Y	N		
Intel® Xeon® Processor E5-1620 v2 4C 3.70GHz	Y	N		
Intel® Xeon® Processor E5-1607 v2 4C 3.00GHz	Y	N		
HP Liquid Cooling option available for all the above processors. Liquid cooling supported on 600W PSU chassis only.				

Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP DreamColor LP2480zx Professional Display				
HP Z Display Z30i 30-inch IPS LED Backlit Monitor				
HP Z Display Z27i 27-inch IPS LED Backlit Monitor				
HP Z Display Z24i 24-inch IPS LED Backlit Monitor				
HP Z Display Z23i 23-inch IPS LED Backlit Monitor				
HP Z Display Z22i 21.5-inch IPS LED Backlit Monitor				
Supported by all operating systems available from HP				
Screen size measured diagonally				

Hard Drives

Sub-Section Description/Notes

Up to (4) 3.5-inch 15K rpm SAS drives: 300, 450, 600 GB; 2.4 TB max

Up to (4) 2.5-inch 10K rpm SAS drives: 300, 600, 900 GB, 1.2 TB; 4.8 TB max

NOTE: SAS controller add-in card required

NOTE: 4th SFF HDDs will be automatically installed into the Z2/Z4 Handle and Dual SFF Drive Adapter in Top ODD Bay part

Removable Boot Drive option

SAS Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations				
600GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	VM647AA	
450GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU968AA	

Supported Components

300GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU967AA
HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA
HP 900GB SAS 10K SFF HDD	Y	Y	E2P03AA
HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA
HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA

Sub-Section Description/Notes

Up to (4) 3.5-inch 7200 rpm SATA drives: 250, 500 GB, 1.0, 2.0, 3.0 TB; 12.0 TB max

Up to (4) 2.5-inch 10K rpm SATA drives: 250, 500 GB, 1.0 TB; 4.0 TB max

Up to (1) 2.5-inch SATA Self-Encrypting Drive (SED): 500 GB

Removable Boot Drive option

SATA Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations

500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA
250GB SATA 10K rpm SFF HDD	Y	Y	B8X18AA
500GB SATA 10K rpm SFF HDD	Y	Y	B8X19AA
1TB SATA 10K rpm SFF HDD	Y	Y	B8X20AA
500GB SATA 7.2K SED SFF HDD	Y	N	

Sub-Section Description/Notes

Up to (4) 2.5-inch Micron 6Gb/s SATA Solid State Drives: 128, 256, 512 GB; 3.0 TB max

Up to (1) 2.5-inch SATA Self-Encrypting Solid State Drive (SED SSD): Micron 6Gb/s 256 GB

Up to (4) 2.5-inch Seagate 600 Pro 6Gb/s SATA Solid State Drives: 120, 240, 480 GB; 1.9 TB max

Up to (1) 2.5-inch Intel Pro 1500 6Gb/s SATA Solid State Drive: 180 GB

NOTE: 4th SSDs will be automatically installed into the Z2/Z4 Handle and Dual SFF Drive Adapter in Top ODD Bay part

SATA Solid State Drives

HP Solid State Drives (SSDs) for Workstations

HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA
HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA
HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA
HP 256GB SATA 6Gb/s SED SSD	Y	N	
Seagate 600 Pro 120GB SATA SSD	Y	Y	E9Q50AA
Seagate 600 Pro 240GB SATA SSD	Y	Y	E9Q51AA
Seagate 600 Pro 480GB SATA SSD	Y	Y	E9Q52AA
Intel Pro 1500 180GB SATA SSD	Y	Y	F5Z70AA

PCIe SSDs

PCIe SSDs for HP Workstations

Fusion ioFX 410GB PCIe Accelerator	Y	Y	E4W49AA
HP Z Turbo Drive 512GB SSD*	Y	Y	G3G89AA
HP Z Turbo Drive 256GB SSD*	Y	Y	G3G88AA

Supported Components

*Each drive requires a PCIe x4 (minimum) slot to be available. Full performance is obtained only when using PCIe slots connected to the CPU. Non-CPU PCIe slots may see a decrease of up to 10%. Please see slot configuration recommendations at www.hp.com/go/zturbo. Note that graphics cards, Thunderbolt™, and other devices will require PCIe slots.

For hard drives, 1 GB = 1 billion bytes; TB = 1 trillion bytes. Actual formatted capacity is less.

Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated SATA 6.0 Gb/s Controller				
Integrated SATA 6.0 Gb/s Controller	Y	N		Two ports
Integrated SATA 3.0 Gb/s Controller				
Integrated SATA 3.0 Gb/s Controller	Y	N		Four ports
Factory integrated RAID on motherboard for SATA drives				
RAID 0 Configuration - Striped Array	Y	N		Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		Note 1
RAID 1 Configuration - Mirrored Array	Y	N		Note 1
RAID 10 Configuration - Striped/Mirrored Array	Y	N		Note 1
RAID 5 Configuration - Parity Array	Y	N		Note 1
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card				
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA	Note 2
LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit				
LSI 9270-8i SAS 6Gb/s ROC RAID Card	Y	Y	E0X21AA	Note 2
LSI iBBU09 Battery Backup Unit	N	Y	E0X19AA	

SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit http://www.hp.com/support/linux_hardware_matrix for RAID capabilities with Linux.

All drives must be identical in type and capacity.

RAID arrays greater than 2 TB are fully supported.

NOTE 1: Requires hard drives with identical speed, capacity, and interface. Specific user-configured hardware SAS RAID configurations are supported on this Linux system. For details, please visit http://www.hp.com/support/linux_hardware_matrix

NOTE 2: Specific user-configured hardware SAS RAID configurations are supported on this Linux system.

IS: Striping of 2 or more HDDs into a single logical volume

IM: Mirroring of 2 HDDs into a single logical volume

IME: Mirroring of 3 or more HDDs into a single logical volume.

For details, please visit http://www.hp.com/support/linux_hardware_matrix

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Mixed?
Professional 2D						
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	Note 1	3	YES
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 1	3	NO
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 2	2	YES
Entry 3D						

Supported Components

NVIDIA Quadro 410 512MB Graphics	Y	Y	A7U60AA		2	NO
NVIDIA Quadro K600 1GB Graphics	Y	Y	C2J92AA		2	NO
AMD FirePro V3900 1GB Graphics	Y	Y	A6R69AA	Note 5	2	NO
Mid-range 3D						
NVIDIA Quadro K2000 2GB Graphics	Y	Y	C2J93AA	Note 5	2	NO
High End 3D						
AMD FirePro W7000 4GB Graphics	Y	Y	C2K00AA	Notes 3, 4	1	NO
NVIDIA Quadro K4000 3GB Graphics	Y	Y	C2J94AA	Notes 3, 4	1	NO
NVIDIA Quadro K5000 4GB Graphics	Y	Y	C2J95AA	Notes 3, 4	1	NO
NVIDIA Quadro K6000 12GB Graphics	N	Y	WS097AA	Notes 3, 4	1	NO

NOTE 1: When configuring with a 3rd NVS 300, 310, or 315--the configuration requires the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

NOTE 2: If 1st graphics card is NVS 510 then 2nd graphics card must be NVS 510 or NVS 310.

NOTE 3: Configuration requires the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

NOTE 4: Supported on 600W PSU chassis only.

NOTE 5: Dual graphics configuration supported on 600W PSU chassis only.

High Performance GPU Computing

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
NVIDIA Tesla K20c Compute Processor	Y	Y	C2J97AA	Notes 1, 2, 3
NVIDIA Tesla K40 Compute Processor	Y	Y	F4A88AA	Notes 1, 2, 3

NOTE 1: This device does not have an operational graphics output.

Tesla K20c/K40 configurations require the addition of either NVIDIA Quadro K600 1st graphics or NVIDIA Quadro K2000 1st graphics.

NOTE 2: All Tesla configurations require the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

NOTE 3: Supported on 600W PSU chassis only.

Memory	CTO	Option Kit Part Number	Support Notes
DDR3-1600 ECC Unbuffered DIMMs - CTO			
8GB DDR3-1600 ECC Unbuffered RAM			Note 2
4GB DDR3-1600 ECC Unbuffered RAM			
2GB DDR3-1600 ECC Unbuffered RAM			
DDR3-1866 ECC Unbuffered DIMMs - CTO			
8GB DDR3-1866 ECC Unbuffered RAM			Note 2
4GB DDR3-1866 ECC Unbuffered RAM			
2GB DDR3-1866 ECC Unbuffered RAM			

Sub-Section Description/Notes

For details on the supported memory configurations on the HP Z420 Workstation, please refer to the System Technical Specifications - System Board section of this document.

Each processor supports up to 4 channels of DDR3 memory. To realize full performance at least 1 DIMM must be inserted into each channel.

The CPUs determine the speed at which the memory is clocked. If a 1066MHz capable CPU is used in

Supported Components

the system, the maximum speed the memory will run at is 1066MHz regardless of the specified speed of the memory.

AMO

DDR3-1600 ECC Unbuffered DIMMs - AMO

HP 8GB (1x8GB) DDR3-1600 ECC RAM	A2Z50AA	Note 2
HP 4GB (1x4GB) DDR3-1600 ECC RAM	A2Z48AA	
HP 2GB (1x2GB) DDR3-1600 ECC RAM	A2Z47AA	

DDR3-1866 ECC Unbuffered DIMMs - AMO

HP 8GB (1x8GB) DDR3-1866 ECC RAM	E2Q93AA	Note 2
HP 4GB (1x4GB) DDR3-1866 ECC RAM	E2Q91AA	
HP 2GB (1x2GB) DDR3-1866 ECC RAM	E2Q90AA	

For details on the supported memory configurations on the HP Z420 Workstation, please refer to the System Technical Specifications - System Board section of this document.

Each processor supports up to 4 channels of DDR3 memory. To realize full performance at least 1 DIMM must be inserted into each channel.

The CPUs determine the speed at which the memory is clocked. If a 1066MHz capable CPU is used in the system, the maximum speed the memory will run at is 1066MHz regardless of the specified speed of the memory.

NOTE 1: Only unbuffered DDR3 DIMMs are supported.

NOTE 2: 8GB DIMMs are only supported when configured in a Z420 system that includes both the 600W power supply option and HP Z420 Front Memory Duct.

Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel/Realtek HD ALC262 Audio	Y	N		
HP Thin USB Powered Speakers	Y	Y	KK912AA	

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 16X DVD-ROM SATA Drive (non Lightscribe)	Y	Y	AR629AA	Note 1
HP 16X DVD+/-RW SuperMulti SATA Drive (non-Lightscribe)	Y	Y	QS208AA	
HP Blu-ray Writer	Y	Y	AR482AA	Note 2
HP 14-in-1 Media Card Reader	Y	Y	E5G19AA	
HP CMT Handle in Top Optical Bay	Y	Y	A9A48AA	Note 3
HP 15-in-1 Media Card Reader	Y	Y	G1S79AA	

Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played

Supported Components

on this workstation.

NOTE 1: Not supported as a 2nd drive option.

NOTE 2: Cannot be ordered in combination with another Blu-ray Writer.

NOTE 3: The Z2/Z4 Handle and Dual SFF Drive Adapter in Top ODD Bay kit, which contains two SFF internal drive bays, is installed automatically when customers order a 4th SFF hard drive.

Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire PCIe Card	Y	Y	NK653AA	
HP Thunderbolt-2 PCIe 1-port I/O Card	Y	Y	F3F43AA	Note 1

NOTE 1: Compatible with NVIDIA Quadro K2000, K4000, and K5000 only.

Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel 82579LM PCIe GbE Controller	Y	N		
Intel Gigabit CT Desktop NIC	Y	Y	FH969AA	Note 1
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
Broadcom NetXtreme Gigabit Ethernet Plus NIC (PCIe)	Y	Y	FS215AA	Notes 1 & 2
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
HP Wireless NIC 802.11b/g/n PCIe Card	N	Y	FH971AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	

NOTE 1: Gigabit Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

NOTE 2: This is a PCI Express card based on the Broadcom 5761 chip. This card does not support DASH 1.1 manageability on this platform.

Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Solenoid Hood Lock & Hood Sensor	Y	Y	DE618A	
HP Business PC Security Lock Kit	N	Y	PV606AA	
HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	WH340AA	

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Keyboard	Y	Y	QY774AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Smart Card Keyboard	Y	Y	E6D77AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	

Supported Components

HP Wireless Keyboard and Mouse	N	Y	QY449AA
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA
Product numbers QY774AA-QY778AA represent the new 2012 products with the updated product design. The previous models will be phased out over time			

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z420 Front Memory Duct	Y	Y	C4J29AA	Note 1
HP Z4 Fan and Front Card Guide Kit	Y	Y	A2Z46AA	
HP Serial Port Adapter	Y	Y	PA716A	
HP Internal USB Port Kit	N	Y	EM165AA	Note 2
HP eSATA PCI Cable Kit	Y	Y	GM110AA	Note 3
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP Power Cord Kit	N	Y	DM293A	
Configure minitower in desktop orientation	Y	N		
HP Workstation Mouse Pad	Y	N		Japan only
HP Energy Star Enabled Configuration	Y	N		

Note 1: The HP Z420 Front Memory Duct is available to add to any configuration for improved system cooling, but is required for memory configurations using 8GB DIMMs and for configurations including the HP Liquid Cooling Solution thermal kit.

Note 2: The HP Internal USB Port kit has a single USB 2.0 type A connector.

Note 3: No hot plug / hot swap supported

Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 6.0	Y	N		Note 2
HP ProtectTools Security	Y	N		Note 3
MS Office Home & Business 2013	Y	N		Note 4
HP Power Assistant	Y	N		
PDF Complete - Corporate Edition	Y	N		
Cyberlink Media Suite & PowerDVD	Y	N		Media playback/authoring software

NOTE 1: Available as a free download here: www.hp.com/go/performanceadvisor

NOTE 2: Supports both 32 and 64 bit versions of Windows 7 Professional and Enterprise, Windows XP Professional and Enterprise, and RHEL V6

NOTE 3: Must select as a Configure to Order option. Delivered as a "Drop in the Box" CD

NOTE 4: Must select as a Configure to Order option

Operating Systems

Support Notes

Windows 8.1 Pro 64-bit
 Windows 8.1 Simplified Chinese Edition 64-bit
 Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit

Supported Components

Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit (National Academic)	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit (National Academic)	
Windows 8 Pro 64-bit	
Windows 8 Simplified Chinese Edition 64-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 64-bit	
Genuine Windows® 7 Ultimate 64-bit	Note 1
Genuine Windows® 7 Professional 32-bit	Note 1
Genuine Windows® 7 Professional 64-bit	Note 1
SUSE Linux Enterprise Desktop 11	
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	Note 2
NOTE 1: See http://www.microsoft.com/windows/windows-7/ for support details.	
NOTE 2: This second OS must be ordered with the HP Linux Installer Kit as the first OS.	

System Technical Specifications

System Board

System Board Form Factor	ATX 243.84 x 304.8 mm (9.6 x 12 inches)
Processor Socket	Single LGA2011
CPU Bus Speed	QPI: Up to 8.0GT/sec
Chipset	Intel® C602 Chipset
Super I/O Controller	Nuvoton NPCD379H (SIO-12)
Memory Expansion Slots	8 DDR3 memory slots
Memory Type Supported	DDR3, UDIMM (Unbuffered), ECC
Memory Modes	Channel Interleaved
Memory Speed Supported	1066MHz, 1333MHz, 1600MHz, and 1866MHz
Memory Protection	ECC available on data, parity on address and command
Memory	
Memory Configuration Table	Please refer to the table below for details on how supported memory configurations are installed in your system.

Capacity (GB)	Type	Front Slots				Rear Slots			
		DIMM 1	DIMM 2	DIMM 3	DIMM 4	DIMM 5	DIMM 6	DIMM 7	DIMM 8
2	UDIMM	2GB							
4	UDIMM	2GB							2GB
6	UDIMM	2GB		2GB					2GB
8	UDIMM	2GB		2GB			2GB		2GB
16	UDIMM	2GB	2GB	2GB	2GB	2GB	2GB	2GB	2GB
4	UDIMM	4GB							
8	UDIMM	4GB							4GB
12	UDIMM	4GB		4GB					4GB
16	UDIMM	4GB		4GB			4GB		4GB
32	UDIMM	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB
8	UDIMM	8GB							
16	UDIMM	8GB							8GB
24	UDIMM	8GB		8GB					8GB
32	UDIMM	8GB		8GB			8GB		8GB
64	UDIMM	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB
Slot Load Order		1	5	3	7	8	4	6	2

For a detailed diagram, please refer to the label located on the inside of the system side panel.

Maximum Memory	Supports up to 64GB (600W PSU) and 32GB (400W PSU)
Memory Configuration (Supported)	Only ECC DIMMs are supported.
Note on Maximum	*Maximum memory capacities assume 64-bit operating systems such as Genuine Windows® 7 Ultimate

System Technical Specifications

Memory	64-bit or Genuine Windows® 7 Professional 64-bit. Genuine Windows® 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB.	
PCI Express Connectors	2 x16 PCIe Gen3 1 x8 PCIe Gen3 1 x8 PCIe (x4) Gen2 1 x4 PCIe (x1) Gen2	
PCI Connectors (5.0V)	1 PCI	
Supported Drive Interfaces	SATA	Integrated 6-channel SATA interface (2@6Gb/s, 4@3Gb/s). Supports RAID 0, 1, 5, 10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	Integrated RAID	NOTE: Requires identical hard drives (speeds, capacity, interface)
Integrated Graphics	No	
Network Controller	Integrated Intel 82579 Gbit LAN Supports the following management functionalities: Intel AMT7.0, TXT, DASH 1.1, WOL, and PXE 2.1	
External SATA (eSATA)	6 ports are eSATA configurable with optional eSATA After-Market Option cable kit (No hot plug / hot swap supported).	
IDE connector	No	
Floppy connector	No	
Serial	1 internal header	
2nd Serial	No	
Parallel	No	
AUX IN (audio)	No	
IEEE 1394 Connector(s)	Front	1 IEEE 1394a standard
	Rear	1 IEEE 1394a standard; 2 IEEE 1394b (requires optional PCIe card)
	Internal	No
USB Connector(s)	Front	2 USB 3.0 1 USB 2.0
	Rear	2 USB 3.0 4 USB 2.0
	Internal	6 USB 2.0 ports available by three separate 2x5 headers: each header supports either one HP Internal USB Port Kit or one USB Media Card Reader. Each Internal Port Kit has one USB 2.0 connector.
HD Integrated Audio	Realtek ALC262	
Flash ROM	Yes	
CPU Fan Header	Yes	
Chassis Fan Header	1 Rear System Chassis Fan Header	
Front PCI Fan Header	Yes	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 1.2	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	

System Technical Specifications

Clear Password Jumper	Yes
Serial Port	1 internal header
Parallel Port	No
Keyboard/Mouse	USB or PS/2

Power Supply

Power Supply	600W 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)		400W 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)
Operating Voltage Range	90–269 VAC		90–269 VAC
Rated Voltage Range	100–240 VAC	118 VAC	100–240 VAC
Rated Line Frequency	50–60 Hz	400 Hz	50–60 Hz
Operating Line Frequency Range	47–66 Hz	393–407 Hz	47–66 Hz
Rated Input Current	100–240 V @ 8.0 A	118 V @ 8.0 A	100–240V @ 5.5A
Heat Dissipation	Typical: 1365btu/hr (344 kg-cal/hr) Maximum: 2354btu/hr (593 kg-cal/hr)		Typical = 910 btu/hr (229 kg-cal/hr) Max = 1569 btu/hr (395 kg-cal/hr)
Power Supply Fan	92x25 mm variable speed		92x25 mm variable speed
ENERGY STAR Qualified (Configuration dependent)	Yes		Yes
80 PLUS® Compliant	Yes, 90% Efficient The Z420 600W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT_PACKARD_623193-001_ECOS_2619_1_600W_Report.pdf		Yes, 90% Efficient The Z420 400W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD_619397-001_ECOS%202277%201_400W_Report.pdf
FEMP Standby Power Compliant @115V (Wake-on LAN disabled) (<2W in S5 - Power Off)	Yes		Yes
EuP Compliant @ 230V (<1 W in S5 - Power Off)	Yes		Yes
CECP Compliant @ 220V (<4W in S3 - Suspend to RAM)	Yes; Configuration dependent		Yes; Configuration dependent
Power Consumption in	<10W		<10W

System Technical Specifications

sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC) measured at 115V.		
Built-in Self Test LED	Yes	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes	Yes

Hood Lock Header	Yes
Hood Sensor Header	Yes
Memory Fan	1 Memory Fan Header

System Configurations							
Example Configuration #1 (ENERGY STAR QUALIFIED)	Processor Info	1x Intel Xeon E5-1603 (Quad-Core)					
	Memory Info	1x 2GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA NVS 300					
	Disks/Optical/Floppy	1x 250GB SATA 7200/1x 16X DVD-ROM SATA					
	PSU	600W 90% Custom PSU					
	Other	-					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	50.0 W		48.9 W		49.5 W	
	Windows Busy Typ (S0)	118 W		115 W		118 W	
	Windows Busy Max (S0)	130 W		127 W		129 W	
	Sleep (S3)	3.56 W	3.42 W	3.782 W	3.66 W	3.53 W	3.41 W
	Off (S5)	1.34 W	1.20 W	1.58 W	1.45 W	1.31 W	1.18 W
	Zero Power Mode (ErP)	0.20 W		0.43 W		0.17 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	171 btu/hr		167 btu/hr		169 btu/hr	
	Windows Busy Typ (S0)	403 btu/hr		392 btu/hr		403 btu/hr	
	Windows Busy Max (S0)	444 btu/hr		433 btu/hr		440 btu/hr	
	Sleep (S3)	12.2 btu/hr	11.7 btu/hr	12.9 btu/hr	12.5 btu/hr	12.0 btu/hr	11.6 btu/hr
	Off (S5)	4.57 btu/hr	4.09 btu/hr	5.39 btu/hr	4.95 btu/hr	4.47 btu/hr	4.03 btu/hr
	Zero Power Mode (ErP)	0.68 btu/hr		1.47 btu/hr		0.58 btu/hr	

Example Configuration #2 (ENERGY STAR QUALIFIED)	Processor Info	1x Intel Xeon E5-1650 (Six-Core)					
	Memory Info	2x 4GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA Quadro 2000					
	Disks/Optical/Floppy	2x 500GB SATA 7200/1x 16X DVD+-RW SuperMulti SATA					
	Power Supply	600W 90% Custom PSU					
	Other	-					

System Technical Specifications

Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	73.9 W		72.9 W		73.8 W	
	Windows Busy Typ (S0)	272 W		270 W		277 W	
	Windows Busy Max (S0)	298 W		294 W		300 W	
	Sleep (S3)	4.31 W	4.18 W	4.53 W	4.41 W	4.27 W	4.17 W
	Off (S5)	1.35 W	1.20 W	1.59 W	1.44 W	1.32 W	1.17 W
	Zero Power Mode (ErP)	0.21 W		0.43 W		0.17 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	252 btu/hr		249 btu/hr		252 btu/hr	
	Windows Busy Typ (S0)	928 btu/hr		921 btu/hr		945 btu/hr	
	Windows Busy Max (S0)	1017 btu/hr		1003 btu/hr		1024 btu/hr	
	Sleep (S3)	14.7 btu/hr	14.3 btu/hr	15.5 btu/hr	15.1 btu/hr	14.6 btu/hr	14.2 btu/hr
	Off (S5)	4.61 btu/hr	4.09 btu/hr	5.43 btu/hr	4.91 btu/hr	4.50 btu/hr	3.99 btu/hr
	Zero Power Mode (ErP)	0.72 btu/hr		1.47 btu/hr		0.58 btu/hr	

Example Configuration #3	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1x Intel Xeon E5-2665 (Eight-Core) 8x 4GB DDR3 1600 (UDIMM) 1x NVIDIA Quadro 5000 4x 600GB SAS 15K/1x 16X DVD+-RW SuperMulti SATA 600W 90% Custom PSU LSI 9212 SAS Card
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Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	152 W		151 W		154 W	
	Windows Busy Typ (S0)	347 W		346 W		354 W	
	Windows Busy Max (S0)	421 W		430 W		432 W	
	Sleep (S3)	6.77 W	6.68 W	6.96 W	6.82 W	6.79 W	6.63 W
	Off (S5)	1.33 W	1.20 W	1.55 W	1.42 W	1.30 W	1.18 W
	Zero Power Mode (ErP)	0.19 W		0.41 W		0.16 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	519 btu/hr		515 btu/hr		525 btu/hr	
	Windows Busy Typ (S0)	1184 btu/hr		1181 btu/hr		1208 btu/hr	
	Windows Busy Max (S0)	1437 btu/hr		1467 btu/hr		1474 btu/hr	
	Sleep (S3)	23.1 btu/hr	23.8 btu/hr	23.8 btu/hr	23.3 btu/hr	23.2 btu/hr	22.6 btu/hr
	Off (S5)	4.54 btu/hr	4.09 btu/hr	5.29 btu/hr	4.85 btu/hr	4.44 btu/hr	4.03 btu/hr
	Zero Power Mode (ErP)	0.65 btu/hr		1.40 btu/hr		0.55 btu/hr	

Z420 400W Configuration #1	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1x Intel Xeon E5-1603 2.8GHz 4C CPU HP 4GB (1x4GB) DDR3 1866 ECC RAM 1x NVIDIA NVS 315 Graphics 1x Seagate 600 Pro 240GB SATA SSD / 1xDVD-ROM SATA 400W 90% Custom PSU -
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Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	47 W		47 W		47 W	
	Windows Busy Typ (S0)	105 W		104 W		106 W	

System Technical Specifications

Heat Dissipation**	Windows Busy Max (S0)	112 W		112 W		110 W	
	Sleep (S3)	4.03 W	3.88 W	4.23 W	4.08 W	4.04 W	3.88 W
	Off (S5)	1.26 W	1.14 W	1.44 W	1.32 W	1.25 W	1.13 W
	Zero Power Mode (ErP)	0.17 W		0.35 W		0.16 W	
		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	160 Btu/hr		160 Btu/hr		160 Btu/hr	
	Windows Busy Typ (S0)	358 Btu/hr		355 Btu/hr		362 Btu/hr	
	Windows Busy Max (S0)	382 Btu/hr		382 Btu/hr		375 Btu/hr	
	Sleep (S3)	13.8 Btu/hr	13.2 Btu/hr	14.4 Btu/hr	13.9 Btu/hr	13.8 Btu/hr	13.2 Btu/hr
Energy Consumption	Off (S5)	4.30 Btu/hr	3.89 Btu/hr	4.91 Btu/hr	4.50 Btu/hr	4.27 Btu/hr	3.86 Btu/hr
	Zero Power Mode (ErP)	0.58 btu/hr		1.19 btu/hr		0.55 btu/hr	

Z420 400W Configuration #2	Processor Info	1x Intel Xeon E5-1680v2 3.7GHz 4C CPU					
	Memory Info	HP 32GB (8x4GB) DDR3 1866 ECC RAM					
	Graphics Info	1x AMD FirePro V3900 Graphics					
	Disks/Optical/Floppy	3x 500GB SATA 7200 HDD / 1xDVD+-RW SATA					
	Power Supply	400W 90% Custom PSU					
	Other	-					
		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	66 W		66 W		66 W	
	Windows Busy Typ (S0)	187 W		185 W		188 W	
Heat Dissipation**	Windows Busy Max (S0)	229 W		224 W		231 W	
	Sleep (S3)	6.26 W	6.10 W	6.46 W	6.33 W	6.24 W	6.09 W
	Off (S5)	1.28 W	1.16 W	1.47 W	1.33 W	1.26 W	1.14 W
	Zero Power Mode (ErP)	0.17 W		0.34 W		0.16 W	
		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	225 Btu/hr		225 Btu/hr		225 Btu/hr	
	Windows Busy Typ (S0)	638 Btu/hr		631 Btu/hr		641 Btu/hr	
	Windows Busy Max (S0)	781 Btu/hr		764 Btu/hr		788 Btu/hr	
	Sleep (S3)	21.4 Btu/hr	20.8 Btu/hr	22.0 Btu/hr	21.6 Btu/hr	21.3 Btu/hr	20.8 Btu/hr
Energy Consumption	Off (S5)	4.37 Btu/hr	3.96 Btu/hr	5.02 Btu/hr	4.54 Btu/hr	4.30 Btu/hr	3.89 Btu/hr
	Zero Power Mode (ErP)	0.58 btu/hr		1.16 btu/hr		0.55 btu/hr	

Declared Noise Emissions (Entry-level and High-end configurations)		
System Configuration (Entry level)	Processor Info	Intel Xeon E5-2665 2.40 GHz
	Memory Info	4 - DDR3 2 GB 1600 MHz UDIMM
	Graphics Info	NVIDIA Q400
	Disks/Optical/Floppy	Single 500 GB 7200 RPM SATA DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
Idle		3.5	18
SATA Hard drive Operating		3.6	19

System Technical Specifications

	(random reads)		
	DVD-ROM Operating (sequential reads)	5.2	37

System Configuration (High-end)	Processor Info	Intel Xeon E5-1660 3.30 GHz
	Memory Info	8 - 4 GB DDR3 1600 MHz UDIMM
	Graphics Info	NVIDIA Q4000
	Disks/Optical/Floppy	2 - 600 GB 15K RPM SAS 3.5" DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
	Idle	4.9	32
	SATA Hard drive Operating (random reads)	5.0	34
	DVD-ROM Operating (sequential reads)	5.3	41

Environmental Requirements	Temperature	Operating: 5° to 35° C (40° to 95° F) Non-operating: -40° to 60° C (-40° to 140° F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 3,000 m (10,000 feet) Non-operating: 9,100 m (30,000 feet)
	Dynamic (new)	Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g NOTE: Values represent individual shock events and do not indicate repetitive shock events. Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz NOTE: Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5,000 ft) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1,000 ft) elevation increase

Physical Security and Serviceability

Access Panel	Tool-less Includes system board and memory information.
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on primary serviceable components.

System Technical Specifications

Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-In
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes, at POST screen on reboot
Restore CD/DVD Set	Restores the computer to its original factory shipping image; can be obtained via HP Support.
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 5.56 mm (0.2188 in) diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
Rear Port Control Cover	Yes (optional); locks rear IO cables to prevent cable theft
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
Power Supply Diagnostic LED	Yes
Front Power Button	Yes, ACPI multi-function
Rear Power Button	Yes
Front Power LED	Yes, blue (normal), red (fault)
Front Hard Drive Activity LED	Yes, green
Front ODD Activity LED	Yes
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.

System Technical Specifications

Cooling Solutions	Air cooled forced convection, liquid cooling (optional)
Power Supply Fans	92 mm x 92 mm x 25 mm 4-wire (non-serviceable)
CPU Heatsink Fan	92 x 25 mm 5-wire PWM
Chassis Fan	92 mm x 92mm x 25 mm 4-wire PWM
Memory Heatsink Fan	Yes, rear memory
HP Advanced System Diagnostics Offline Edition	<p>HP Vision Diagnostics Offline Edition</p> <p>The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to:</p> <ul style="list-style-type: none"> • Run diagnostics • View the hardware configuration of the system <p>Key features and benefits</p> <p>HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision Diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are:</p> <ul style="list-style-type: none"> • Testing and diagnosing apparent hardware failures • Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance • Sending configuration information to another location for more in-depth analysis
Access Panel Key Lock	No
ACPI-Ready Hardware	<p>Advanced Configuration and Power Management Interface (ACPI).</p> <ul style="list-style-type: none"> • Allows the system to wake from a low power mode. • Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system
Trusted Platform Module Chip with optional ProtectTools Software	Yes, Infineon SLB9635TT1.2
Integrated Chassis Handles	<p>No</p> <p>Optional Handle in Top Optical Bay kit</p>
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (optional), front (full-length cards with extender, used in with the front card guide and fan holder)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes

System Technical Specifications

DIMM Connectors	Yes
HP ProtectTools Security Manager	Yes - Not supported on Linux
BIOS	
BIOS 32-bit Services	Standard BIOS 32-bit Service Directory Proposal v0.4
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01.
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications
BIOS Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM
Replicated Setup	Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.7, for system management information.
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"> NORMAL - normal temperature ranges. ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 2.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from	Allows a new or existing system to boot over the network and download software, including the operating system.

System Technical Specifications

Server)	
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED
Industry Standard Specification Support	
UEFI Specification Revision	2.3.1
Industry Standard	Revision Supported by the BIOS
ACPI	Advanced Configuration and Power Management Interface, Version 2.0c
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	<ul style="list-style-type: none"> Enhanced Disk Drive Specification Version 1.1 BIOS Enhanced Disk Drive Specification Version 3.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7
PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	<ul style="list-style-type: none"> Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification

System Technical Specifications

SMBIOS	System Management BIOS Reference Specification, Version 2.7
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Social and Environmental Responsibility

Eco-Label Certifications & Declarations	<p>This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:</p> <ul style="list-style-type: none"> ENERGY STAR® (energy-saving features available on selected configurations-Windows only) US Federal Energy Management Program (FEMP) China Energy Conservation Program IT ECO declaration
Batteries	<p>The battery in this product complies with EU Directive 2006/66/EC</p> <p>Battery size: CR2032 (coin cell)</p> <p>Battery type: Lithium Metal</p> <p>The battery in this product does not contain:</p> <ul style="list-style-type: none"> Mercury greater than 5ppm by weight Cadmium greater than 10ppm by weight Lead greater than 40ppm by weight
Restricted Material Usage	<p>This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/qse.pdf</p> <p>Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.</p>
Low Halogen Statement	<p>This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: 3 ½" SAS HDDs, Liquid Cooling Solution, and Broadcom 5761 Gigabit PCIe NIC are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.</p>
End-of-Life Management and Recycling	<p>Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.</p>
Hewlett-Packard Corporate Environmental Information	<p>For more information about HP's commitment to the environment:</p> <p>Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</p>
Additional Information	<p>This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.</p> <ul style="list-style-type: none"> Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. This product is >90% recycle-able when properly disposed of at end of life. <p>EPEAT Gold registered in the U.S. EPEAT registration varies by country. See www.epeat.net for registration status by country</p>
Packaging	<p>HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html</p> <ul style="list-style-type: none"> Does not contain restricted substances listed in HP Standard 011-1 General Specification for

System Technical Specifications

	<p>the Environment</p> <ul style="list-style-type: none"> Does not contain ozone-depleting substances (ODS) Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed Maximizes the use of post-consumer recycled content materials in packaging materials All packaging material is recyclable All packaging material is designed for ease of disassembly Reduced size and weight of packages to improve transportation fuel efficiency Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting
Packaging Materials	
Internal	Cushions and plastic bags made of low density polyethylene (LDPE).
External	Outer carton, accessories carton, and insert made of corrugated paper board.

Manageability

Industry Standard Specifications	<p>This product meets the following industry standard specifications for manageability functionality:</p> <ul style="list-style-type: none"> DASH 1.1 required functionalities via Intel LAN on motherboard
Intel Active Management Technology (AMT)	<p>Intel Active Management Technology (AMT) 7.0</p> <p>An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 7.0 includes the following advanced management functions:</p> <ul style="list-style-type: none"> Power Management (on, off, reset) Hardware Inventory (includes BIOS and firmware revisions) Hardware Alerting Agent Presence System Defense Filters SOL/IDER Cisco NAC/SDN Support ME Wake-on-LAN DASH 1.1 compliance IPv6 Support Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance. Remote Alerts - automatically alert IT or service provider if issues arise Access Monitor - Provides oversight into Intel® AMT actions to support security requirements PC Alarm Clock Microsoft NAP Support Host Base set-up and configuration Management Engine (ME) firmware roll back
Intel® vPro™ Technology	<p>The HP Z420 Workstation supports Intel vPro technology when configured as outlined below:</p> <ul style="list-style-type: none"> Intel Xeon processor E5-1600 product family or E5-2600 product family featuring Intel vPro

System Technical Specifications

	<p>Technology</p> <ul style="list-style-type: none"> • Intel C602 chipset • Intel 82579LM GbE LAN
Remote Manageability Software Solutions	<p>The HP Z420 Workstation is supported on the following remote manageability software consoles:</p> <ul style="list-style-type: none"> • LANDesk Management Suite (HP recommended solution) • Microsoft System Center Configuration Manager • HP Client Automation Enterprise <p>For questions or support for manageability needs, please visit http://www.hp.com/go/easydeploy</p>
System Software Manager	<p>For questions or support for SSM, please visit: http://www.hp.com/go/ssm</p>
Service, Support, and Warranty	<p>On-site Warranty and Service (Note 1): Three-years, limited warranty and service offering delivers on-site, next business-day (Note 2) service for parts and labor and includes free telephone support (Note 3) 8am - 5pm. Global coverage (Note 2) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.</p> <p>NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply. NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country. NOTE 3: Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.</p> <p>HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at http://www.hp.com/hps/carepack. Service levels and response times for HP Care Packs may vary depending on your geographic location.</p>
Product Change Notification	<ul style="list-style-type: none"> • Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile. • PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition. • Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.

Stable & Consistent Offerings

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section.

HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers—no special programs, no additional cost, no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

Processors	Product #	Offering
	A2H76AV	Intel® Xeon® Processor E5-1620 4C 3.60GHz
	E2R01AV	Intel® Xeon® Processor E5-1620v2 4C 3.70GHz
Hard Drives	Product #	Offering
	QE198AV	HP 500 GB SATA 7200 1st HDD
	QE199AV	HP 500 GB SATA 7200 2nd HDD
	QE200AV	HP 500 GB SATA 7200 3rd HDD
	QE201AV	HP 500 GB SATA 7200 4th HDD
	QE190AV	HP 1 TB SATA 7200 1st HDD
	QE191AV	HP 1 TB SATA 7200 2nd HDD
	QE192AV	HP 1 TB SATA 7200 3rd HDD
	QE193AV	HP 1 TB SATA 7200 4th HDD
Graphics	Product #	Offering
	A7U44AV	NVIDIA NVS 310 512MB Graphics
	A7U45AV	NVIDIA NVS 310 512MB Graphics (2nd)
Optical and Removable Storage	Product #	Offering
	QE236AV	HP 16X DVD+-RW SuperMulti SATA 1st Drive
	QE237AV	HP 16X DVD+-RW SuperMulti SATA 2nd Drive
Operating Systems	Product #	Offering
	QD971AV	Genuine Windows® 7 Professional 64-bit

Technical Specifications - Processors

Introduction

Intel® Xeon® Processor E5-1620 4C 3.60GHz

Intel® Xeon® Processor E5-1603 4C 2.80GHz

Processor Note

For detailed processor specifications, please refer to the Overview section at the beginning of this document.

Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz

Intel® Xeon® Processor E5-1607 v2 4C 3.00GHz

Intel® Xeon® Processor E5-1620 v2 4C 3.70GHz

Intel® Xeon® Processor E5-1650 v2 6C 3.50GHz

Intel® Xeon® Processor E5-1660 v2 6C 3.70GHz

Intel® Xeon® Processor E5-1680 v2 8C 3.00GHz

Technical Specifications - Hard Drives

HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations	600GB SAS 15K rpm 6Gb/s 3.5" HDD	Capacity	600GB	
		Height	1 in; 2.54 cm	
		Width		Media Diameter 3.5 in; 8.9 cm
				Physical Size 4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6.0 Gb/s	
		Buffer	16 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Logical Blocks	1,172,123,568 - 512 byte blocks	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	450GB SAS 15K rpm 6Gb/s 3.5" HDD	Capacity	450GB	
		Height	1 in; 2.54 cm	
		Width		Media Diameter 3.5 in; 8.9 cm
				Physical Size 4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	300GB SAS 15K rpm 6Gb/s 3.5" HDD	Capacity	300GB	
		Height	1 in; 2.54 cm	
		Width		Media Diameter 3.5 in; 8.9 cm
				Physical Size 4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Operating Temperature	50° to 95° F (10° to 35° C)	

Technical Specifications - Hard Drives

HP 300GB SAS 10K SFF HDD

Capacity	300GB
Height	0.6 in; 1.53 cm
Width	Media Diameter 2.5 in; 6.36 cm
	Physical Size 2.75 in; 6.99 cm
Interface	SAS 6Gb/s
Synchronous Transfer Rate (Maximum)	Up to 600MB/s
Buffer	64MB
Cache	multi-segmentable cache buffer
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 0.4 ms (max)
	Average 3.6 ms
	Full Stroke 7.3 ms
Rotational Speed	10,000 rpm
Logical Blocks	585,937,500
Operating Temperature	41° to 131° F (5° to 55° C)

HP 600GB SAS 10K SFF HDD

Capacity	600GB
Height	0.6 in; 1.53 cm
Width	Media Diameter 2.5 in; 6.36 cm
	Physical Size 2.75 in; 6.99 cm
Interface	SAS 6Gb/s
Synchronous Transfer Rate (Maximum)	Up to 600MB/s
Buffer	64MB
Cache	multi-segmentable cache buffer
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 0.4 ms (max)
	Average 3.6 ms
	Full Stroke 7.3 ms
Rotational Speed	10,000 rpm
Logical Blocks	1,172,123,568
Operating Temperature	41° to 131° F (5° to 55° C)

HP 900GB SAS 10K SFF HDD

Capacity	900GB
Height	0.6 in; 1.53 cm
Width	Media Diameter 2.5 in; 6.36 cm
	Physical Size 2.75 in; 6.99 cm
Interface	SAS 6Gb/s
Synchronous Transfer Rate (Maximum)	Up to 600MB/s
Buffer	64MB
Cache	multi-segmentable cache buffer
Seek Time (typical reads, includes controller overhead, including settling)	Single Track 0.2ms (max)
	Average 3.5 ms
	Full Stroke 7.0 ms

Technical Specifications - Hard Drives

		Rotational Speed	10,000 rpm	
		Logical Blocks	1,758,174,767	
		Operating Temperature	41° to 131° F (5° to 55° C)	
SATA (Serial ATA) Hard Drives for HP Workstations	HP 1.2TB SAS 10K SFF HDD	Capacity	1.2TB	
		Height	0.6 in; 1.53 cm	
		Width	Media Diameter	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	SAS 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	multi-segmentable cache buffer	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.18ms (max)
			Average	3.5ms
			Full Stroke	7.17ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	2,344,225,968	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	250GB SATA 10K rpm SFF HDD	Capacity	250GB	
		Height	0.6 in; 1.53 cm	
		Width	Media Diameter	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	Serial ATA (6Gb/s)	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	Adaptive	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	1.2ms (typical)
			Average	3.6ms
			Full Stroke	9.0ms (typical)
		Rotational Speed	10K rpm	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	500GB SATA 10K rpm SFF HDD	Capacity	500GB	
		Height	0.6 in; 1.53 cm	
		Width	Media Diameter	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	Serial ATA (6Gb/s)	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	Adaptive	

Technical Specifications - Hard Drives

	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Capacity	1TB	
	Height	0.6 in; 1.53 cm	
	Width	Media Diameter	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
1TB SATA 10K rpm SFF HDD	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Capacity	500GB	
	Height	1 in; 2.5 cm	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	16 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	2 ms
		Average	11 ms
		Full Stroke	21 ms
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Rotational Speed	7,200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Capacity	1 Terabyte (1000 GB)	
	Height	1 in; 2.54 cm	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
Buffer		32MB	

Technical Specifications - Hard Drives

		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	2 ms
			Average	11 ms
			Full Stroke	21 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	1,953,525,168	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Capacity	2.0TB	
		Height	1 in; 2.54 cm	
		Width	Media Diameter	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0 Gb/s), NCQ Enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
		Buffer	64MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	1.0 ms
			Average	11 ms
			Full Stroke	18 ms
	3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Rotational Speed	7,200 rpm	
		Logical Blocks	3,907,029,168	
		Operating Temperature	41° to 131° F (5° to 55° C)	
		Capacity	3.0TB	
		Height	1 in; 2.54 cm	
		Width	Media Diameter	3.5 in; 8.9 cm
			Physical Size	4.0 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 6.0 Gb/s	
		Buffer	64MB	
	500GB SATA 7.2K SED SFF HDD	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.6 ms
			Average	11 ms
			Full Stroke	Not Specified
		Rotational Speed	7,200 rpm	
		Operating Temperature	41° to 140° F (5° to 60° C)	
		Capacity	500GB	
		Height	0.275 in; 0.7 cm	
		Width	Media Diameter	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	Serial ATA (6Gb/s)	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	32MB	

Technical Specifications - Hard Drives

		Seek Time (typical reads, includes controller overhead, including settling)	Single Track Average Full Stroke	1ms 4.2ms 25ms (typical)
		Rotational Speed	7,200 rpm	
		Operating Temperature	32° to 140° F (0° to 60° C)	
HP Solid State Drives (SSDs) for Workstations	HP 128GB SATA 6Gb/s SSD	Capacity	128GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SSD	Capacity	256GB	
		Height	0.28 in; 0.7 cm	
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SED SSD	Capacity	256GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 512GB SATA 6Gb/s SSD	Capacity	512GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Seagate 600 Pro 120GB SATA SSD	Capacity	120GB	
		Height	0.276 in; 0.7 cm	
		Width	Physical Size	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	

Technical Specifications - Hard Drives

	Seagate 600 Pro 240GB SATA SSD	Capacity	240GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Seagate 600 Pro 480GB SATA SSD	Capacity	480GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Intel Pro 1500 180GB SATA SSD	Capacity	180GB	
		Width	Physical Size	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
PCIe SSDs for HP Workstations	HP Z Turbo Drive 256GB SSD	Capacity	256GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP Z Turbo Drive 512GB SSD	Capacity	512GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Fusion ioFX 410GB PCIe Accelerator	Capacity	410GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 95° F (0° to 35° C)	

Technical Specifications - Hard Drive Controllers

LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	PCI Bus	8 lanes, PCI Express 3.0
	RAID Levels	Offers Integrated RAID (0, 1, 1E and 10)
	PCI Data Burst Transfer Rate	Half Duplex x8, PCIe, 8000 MB/s
	SAS Bandwidth	Half Duplex 600 MB/s per lane
	PCI Card Type	3.3V Add-in card
	PCI Voltage	12 V ± 10%
	PCI Power	9.8W typical, Airflow min 200 LFM
	Bracket	Full height and low profile
	Certification Level	PCI Express 3.0 compliant
	IO Bus	1x4 6Gb/s SAS ports
	SAS Processor	LSI SAS2308/ Fusion MPT 2.0
	Internal Connectors	One x4 internal mini-SAS (SFF8087)
	External Connectors	One x4 external mini-SAS (SFF8088)
	Maximum Number of SCSI Devices	256 Non-RAID SAS/SATA devices
	LED Indicators	N/A
LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit	PCI Bus	x8 lane PCIe 3.0 compliant
	RAID Levels	RAID 0, 1, 5, and 6 RAID spans 10, 50 and 60
	PCI Card Type	Low profile, single PCIe slot design with full height bracket.
	PCI Voltage	+3.3V Add-in Card
	PCI Power	+3.3V, +12V
	Certification Level	PCI-Express 3.0
	IO Bus	Eight 6Gb/s and 3Gb/s compatible SAS/SATA ports
	SAS Processor	LSISAS2208 Dual-Core RAID on Chip (ROC)
	Internal Connectors	Two SAS SFF8087 x4 (Mini-SAS)
	External Connectors	None
	Maximum Number of SCSI Devices	Up to 128 SAS and/or SATA hard drives and SSDs NOTE: HP Workstations do not support this many internal drives.
	LED Indicators	Heartbeat LED on card

Technical Specifications - Graphics

NVIDIA NVS 310 512MB Graphics	Form Factor	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 310 GPU: GF119-825
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	Connectors	2 x DisplayPort
	Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
	Image Quality Features	The following video formats are supported: <ul style="list-style-type: none"> - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC <p>A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.</p>
	Display Output	Up to 2 displays in the following configurations: <p>DisplayPort output:</p> <ul style="list-style-type: none"> • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. <p>DVI-D output:</p> <ul style="list-style-type: none"> • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors • Drives two digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors <p>HDMI output:</p> <ul style="list-style-type: none"> • NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors

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VGA display output:

- Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

Shading Architecture	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.1
Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Power Consumption	19.5 Watts
Note	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adaptors included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.

NVIDIA NVS 510 2GB Graphics	Form Factor	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 Mhz Memory Clock: 891 Mhz CUDA Cores: 192
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	Four mini-DisplayPort. Four mini-DisplayPort to DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)
	Maximum Resolution	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 × 2160 @ 60Hz)
	Image Quality Features	NOTE: This card supports up to four displays. For Windows XP, only 2 active displays are supported. 10-bit internal display processing, including hardware support for 10-bit scan-out
	Display Output	DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.
		Digital Display Support
		1. DisplayPort Output - Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4

Technical Specifications - Graphics

DisplayPort connectors on the NVS 510 graphics card.

- DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking.

2. DVI-D Output

- Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors.
- Drives four digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors.

3. HDMI Output

- The NVS 510 graphics board is capable of driving four high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors.

Analog Display Support

1. VGA display output

- Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.

Supported Graphics APIs

Full Microsoft DirectX 11, Shader Model 5.0 support
Full OpenGL 4.3 support

Available Graphics Drivers

Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

Power Consumption Note

33.4 Watts
Heatsink cooler design is active.

NVIDIA NVS 315 1GB Graphics (for HP Workstations)

Form Factor

Low Profile:
2.713 inches in height × 5.7 inches in length
Weight: ~142 grams

Graphics Controller

NVIDIA NVS 315 (using GF119-825 GPU)
Number of Cores: 48 CUDA cores
Max. Power: 19.3W
Cooling Solution: Active fan heatsink

Bus Type Memory

PCI Express x16, 2.0 compliant
Size: 1GB DDR3
Clock: 875Mhz
Memory Bandwidth: 14GB/s

Connectors

DMS-59 output
Cables included:
- For CTO: DMS-59 to DVI cable
- For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable

Maximum Resolution

Maximum number of displays supported: 2

Technical Specifications - Graphics

	<p>Maximum Resolution Support:</p> <ul style="list-style-type: none"> - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
Image Quality Features	<p>See Display Output section.</p> <p>The following video formats are supported:</p> <ul style="list-style-type: none"> - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 or later <p>A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.</p>
Display Output	<p>Up to 2 displays using one of the following DMS-59 cables:</p> <p>DMS-59 to DVI</p> <p>DMS-59 to VGA</p> <p>DMS-59 to DP</p> <p>DisplayPort output:</p> <ul style="list-style-type: none"> - Drives two DisplayPort enabled digital displays at resolutions up to 2560 x 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter. <p>DVI-D output:</p> <ul style="list-style-type: none"> - Drives two digital display at resolutions up to 1920 x 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor <p>VGA display output:</p> <ul style="list-style-type: none"> - Drives two analog display at resolutions up to 2048 x 1536 at 85 Hz using DMS-59 to VGA cable adaptor.
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.3
Available Graphics Drivers	<p>Windows 8</p> <p>Microsoft Windows 7 Professional (64-bit and 32-bit)</p> <p>Microsoft Windows XP Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux(RHEL)</p> <p>SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)</p> <p>HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> <p>SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com</p>
Notes	<ol style="list-style-type: none"> 1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured graphics card includes DMS-59 to DVI cable. 3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

Technical Specifications - Graphics

NVIDIA Quadro 410 512MB Graphics	Form Factor	Low Profile: 2.713 inches × 5.7 inches, single slot
	Graphics Controller	NVIDIA Quadro 410 GPU: GK107
	Bus Type	PCI Express x16, 3.0 compliant
	Memory	Size: 512MB DDR3 Clock: 900MHz Memory Bandwidth: 14GB/s
	Connectors	One dual-link DVI-I connector One DisplayPort connector
	Maximum Resolution	VGA (through DVI to VGA cable): <ul style="list-style-type: none"> 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI <ul style="list-style-type: none"> 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI <ul style="list-style-type: none"> 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 <ul style="list-style-type: none"> 3840 × 2160 × 36 bpp at 60 Hz
	RAMDAC	400 MHz integrated RAMDAC
	Display Output	Maximum number of displays supported: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.2
Available Graphics Drivers		Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)
		HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
		SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Notes		1. Factory configured Quadro 410 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro 410 includes one DP to DVI-D adapter
NVIDIA Quadro K600 1GB Graphics	Form Factor	2.731" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included

Technical Specifications - Graphics

Graphics Controller	NVIDIA Quadro K600 Graphics Card Kepler GK107 GPU 192 CUDA cores Max Power: 41 Watts
Bus Type	PCI Express 2.0 x16
Memory	1 GB GDDR3, 891 Mhz 128-bit memory I/O path 29 GB/s memory bandwidth
Connectors	1 DL-DVI(I) output, 1 DisplayPort output CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card
Maximum Resolution	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)
Image Quality Features	DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz 10-bit internal display processing pipeline 10-bit scan-out support
Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to the Quadro K600 DisplayPort connector at this resolution) - Max number of daisy-chained monitors: 2
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit)

HP qualified drivers may be preloaded or available from the HP support

Technical Specifications - Graphics

Web site:

<http://welcome.hp.com/country/us/en/support.html>

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Notes

1. Quadro K600 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K600 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. Quadro K600 is Windows 8 Compliant.
4. A total maximum of 2 active monitors are supported across all display output types.

AMD FirePro V3900 1GB Graphics

Form Factor

Full height, half length (full-height bracket included)

Graphics Controller

AMD FirePro™ V3900 professional graphics

Bus Type

PCI Express® x16, Generation 2.1

Memory

1GB DDR3 memory

Connectors

1 DL DVI, 1 DP output
One DP to DVI adapter included

Maximum Resolution

2560x1600 per display (5120x1600 max. horizontal resolution)

Display Output

1 DisplayPort® 1.2
1 Dual-link DVI

Supported Graphics APIs

OpenCL™ 1.1, DirectX® 11 and OpenGL 4.2

Available Graphics Drivers

Genuine Windows® 7 Professional (64-bit and 32-bit)
Genuine Windows Vista® Business (64-bit and 32-bit)
Microsoft® Windows XP® Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL)
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or available from the HP support

Web site: <http://welcome.hp.com/country/us/en/support.html>

Power Consumption

<50W

Note

AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details.

NVIDIA Quadro K2000 2GB Graphics

Form Factor

4.38" H x 7.97" L
Single Slot, Full Height

Graphics Controller

NVIDIA Quadro K2000 Graphics Card
Kepler GK107 GPU
384 CUDA cores
Max Power: 51.1 Watts

Bus Type

PCI Express 2.0 x16

Memory

2 GB GDDR5, 2000 Mhz
128-bit memory I/O path

Technical Specifications - Graphics

Connectors	<p>64 GB/s memory bandwidth</p> <p>1 DL-DVI(I) output, 2 DisplayPort outputs</p> <p>CTO: No video cable adapter included</p> <p>AMO: One DP-to-DVI adapter included with card</p>
Maximum Resolution	<p>Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories</p> <p>DisplayPort:</p> <ul style="list-style-type: none"> - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)
Image Quality Features	<p>DL-DVI(I) output:</p> <ul style="list-style-type: none"> - up to 2560 x 1600 x 32 bpp @ 60Hz <ul style="list-style-type: none"> • 10-bit internal display processing pipeline • 10-bit scan-out support
Display Output	<p>VGA:</p> <ul style="list-style-type: none"> - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz <p>DL-DVI(I):</p> <ul style="list-style-type: none"> - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz <p>SL-DVI(I):</p> <ul style="list-style-type: none"> - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz <p>DisplayPort:</p> <ul style="list-style-type: none"> - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 <p>Maximum number of monitors across all available Quadro K2000 outputs is 4.</p>
Shading Architecture Supported Graphics APIs	<p>Full Microsoft DirectX 11 Shader Model 5</p> <p>OpenGL 4.3</p> <p>DirectX 11</p> <p>API support includes:</p> <p>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
Available Graphics Drivers	<p>Windows 8 Pro 64-bit</p> <p>Windows 8 (China) 64-bit</p> <p>Genuine Windows 7 Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit)</p> <p>Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation</p> <p>SUSE Linux Enterprise Desktop 11 (64-bit)</p>
	<p>HP qualified drivers may be preloaded or available from the HP support Web site:</p>

Technical Specifications - Graphics

<http://welcome.hp.com/country/us/en/support.html>

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Notes

1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.

AMD FirePro W7000 4GB Graphics

Form Factor

Full height, full length, single slot

Graphics Controller

AMD FirePro™ W7000 Professional Graphics
Max Power: <150 Watts

Bus Type

PCI Express™ x16, Generation 3.0

Memory

4GB GDDR5, 153.6 GB/s bandwidth, ECC support

Connectors

4 x DisplayPort with HBR2 and MST support.

Maximum Resolution

DisplayPort: 4096x2160 @24bpp 60Hz
Dual Link DVI: 2560x1600 (requires DP to DL-DVI adapter)
Single Link DVI: 1920x1200 (requires DP to DVI adapter)
VGA: 1920x1200 (requires DP to VGA adapter)

Image Quality Features

Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component

Display Output

Max number of monitors supported using DisplayPort: 6

Monitor chaining from a single DisplayPort options(subject to a max of 6 total monitors across all outputs, requires use of DisplayPort Monitors supporting MST or the use of DisplayPort hubs):

- 1 4096x2169 display
- 2 2560x1600 displays
- 4 1920x1200 displays

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

OpenGL® 4.2 with OpenGL Shading Language
OpenCL 1.1
Microsoft® DirectX® 11.1

Available Graphics Drivers

Windows 8
Windows 7 Professional (64-bit and 32-bit)
Windows 8 (64bit and 32-bit)
Red Hat Enterprise Linux(RHEL)
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

Note

1. AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s)

Technical Specifications - Graphics

may be required. See www.amd.com/firepro for details.

2. Factory configured FirePro W7000 graphics card does not include any video adapter cables. Adapters must be ordered separately.

3. Option Kit FirePro W7000 graphics card does not include any video cable adapters. Adapters must be ordered separately.

NVIDIA Quadro K4000 3GB Graphics	Form Factor	4.376" H x 9.5" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K4000 Graphics Card Kepler GK106 GPU 768 CUDA cores Max Power: 80 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	3 GB GDDR5, 2800 Mhz 192-bit memory I/O path 134 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card
	Maximum Resolution	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)
	Image Quality Features	DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz <ul style="list-style-type: none"> • 10-bit internal display processing pipeline • 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200

Technical Specifications - Graphics

	<p>HDMI:</p> <ul style="list-style-type: none"> - Requires use of DP-to-HDMI cable - Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz
	<p>Maximum number of monitors across all available Quadro K4000 outputs is 4.</p>
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
Supported Graphics APIs	<p>OpenGL 4.3</p> <p>DirectX 11</p> <p>API support includes:</p> <p>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
Available Graphics Drivers	<p>Windows 8 Pro 64-bit</p> <p>Windows 8 (China) 64-bit</p> <p>Genuine Windows 7 Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit)</p> <p>Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation</p> <p>SUSE Linux Enterprise Desktop 11 (64-bit)</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site:</p> <p>http://welcome.hp.com/country/us/en/support.html</p> <p>SUSE Linux Enterprise drivers may also be obtained from:</p> <p>http://download.nvidia.com/novell or http://www.nvidia.com</p>
Notes	<ol style="list-style-type: none"> 1. Quadro K4000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K4000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. Quadro K4000 is Windows 8 Compliant. 4. A total maximum of 4 active monitors are supported across all display output types. To get 4 monitors, at least one monitor must be daisy chained on a DisplayPort output. 5. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4000 DisplayPort output.

NVIDIA Quadro K5000 4GB Graphics

Form Factor	4.376" H x 10.5" L Dual Slot
Graphics Controller	NVIDIA Quadro K5000 Graphics Card based on the GK104 GPU
Bus Type	PCI Express 2.0 x16
Memory	4GB GDDR5 173GB/s memory bandwidth
Connectors	DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector. No adapter included with card.
	DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories
Image Quality Features	<ul style="list-style-type: none"> • DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support

Technical Specifications - Graphics

		<ul style="list-style-type: none"> NVIDIA 3D Vision™ technology
Display Output		<p>400 MHz integrated RAMDAC</p> <ul style="list-style-type: none"> Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz <p>Dual-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) <p>Single-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) <p>DisplayPort with MST and HBR2.</p> <ul style="list-style-type: none"> Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz <p>HDMI</p> <ul style="list-style-type: none"> Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz
Supported Graphics APIs		<p>OpenGL 4.2 DirectX 11 Shader model 5.0 Support API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran</p>
Available Graphics Drivers		<p>Genuine Windows 7 Professional (64-bit and 32-bit) Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p>
Power Consumption		122 Watts
Note		No display output adapter included.
NVIDIA Quadro K6000 12GB Graphics	Form Factor	4.376" H x 10.5" L Dual Slot Power: 234 Watts Weight: ~880 grams
	Graphics Controller	NVIDIA Quadro K6000 Graphics Card based on the GK180 GPU Core Count: 2880 Base Clock: 797 MHz Boost Clock: 902 MHz
	Bus Type	PCI Express 3.0 x16

Technical Specifications - Graphics

Memory	12GB GDDR5 384-bit memory I/O path 288 GB/s memory bandwidth ECC Memory
Connectors	DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector. Factory configured option: No adapter included with card. Option Kit: No adaptor included with card.
Maximum Resolution	DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories. Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920x1200 @ 120Hz) Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920x1200 @ 120Hz)
Image Quality Features	<ul style="list-style-type: none"> • DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology • NVIDIA Premium Mosaic and nView
Display Output	<p>400 MHz integrated RAMDAC</p> <ul style="list-style-type: none"> • Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz <p>Dual-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) <p>Single-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> • Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) <p>DisplayPort with MST and HBR2.</p> <ul style="list-style-type: none"> • Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz <p>HDMI</p> <ul style="list-style-type: none"> • Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz
Shading Architecture	Shader Model 5.0 Full IEEE 754-2008 32-bit and 64-bit precision
Supported Graphics APIs	Full OpenGL 4.3 Full DirectX 11 CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Windows 7 Professional (64-bit and 32-bit)

Technical Specifications - Graphics

Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or available from the HP support Web site:

<http://welcome.hp.com/country/us/en/support.html>

Novell SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

Notes

1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro K6000 to enable direct mapping of GPU to Virtual Machine.
2. No display output adapter included.

Technical Specifications - High Performance GPU Computing

NVIDIA Tesla K20c Compute Processor

Form Factor	4.376 inches by 10.5 inches Dual Slot
System Interface	PCI Express Gen2 ×16
Video Outputs	None.
Memory	5GB GDDR5, 320-bit memory path
Peak Memory Bandwidth	208 GB/s (with ECC off)
Supported APIs	CUDA and OpenACC API support includes: CUDA C, CUDA C++, Java, Python, and Fortran
Supported Operating Systems	Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 (64-bit)
	HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Processor Cores	GK110 GPU, 706 MHz clock 2496 CUDA cores
Power Consumption	~225 Watts

NOTE 1: A 1125W PSU is required for any K20 configuration on the Z820

NVIDIA Tesla K40 Compute Processor

Form Factor	Size: 4.376 inches by 10.5 inches Slots: Dual Slot Power Connectors: One 6-pin and one 8-pin Weight: ~826 grams
System Interface	PCI Express Gen3 ×16
Video Outputs	None.
Memory	12GB GDDR5, memory path: 384-bit memory clock: 3Ghz
Peak Memory Bandwidth	288 GB/s
Supported APIs	CUDA, OpenACC, OpenCL 1.2 API support includes: C, C++, Java, Python, and Fortran
Supported Operating Systems	Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 (64-bit)
	HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Processor Cores	GK110B GPU Base Clock: 745 MHz

Technical Specifications - High Performance GPU Computing

	Boost Clock: up to 875 Mhz 2888 CUDA cores
Power Consumption	~235 Watts
Tesla K40 GPU Boost	<p>Note 1: A 1125W PSU is required for any K40 configuration on the Z820</p> <p>By default the Tesla K40 active ships with the core clock set to the base clock. HPC workloads can have one or more characteristics as described. When selecting one of the supported boost clocks a good strategy is to characterize the workload with the available boost clocks. For example, DGEMM/Linpack are extremely demanding on power. Therefore, the "base clock" may be the correct choice when running Linpack. Some workloads in life sciences, manufacturing, CFD, CAD, etc., may have power headroom and can take advantage of one of the boost clocks.</p>

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	Frequency Response (-3dB, 24-bit/96kHz input)	F0 to 20kHz
	Dimensions	Speakers: 14.52 x 9.50 x 2.45 cm (5.72 x 3.74 x 0.96 in) per speaker

Technical Specifications - Optical and Removable Storage

HP DVD-ROM Drive	Description	5.25-inch, half-height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	Disc Capacity	DVD-ROM Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	DVD-ROM Single Layer < 140 ms (typical)
		CD-ROM Mode 1 < 125 ms (typical)
		Full Stroke DVD < 250 ms (seek)
		Full Stroke CD < 210 ms (seek)
	Power	Source SATA DC power receptacle
		DC Power Requirements 5 VDC \pm 5%-100 mV ripple p-p 12 VDC \pm 5%-200 mV ripple p-p
		DC Current 5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 90%
	Maximum Wet Bulb Temperature	86° F (30° C)
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.

HP DVD+/-RW Drive	Description	5.25-inch, half-height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	15.0 x 4.4 x 17.5 cm (5.9 x 1.7 x 8.0 in)
	Disc Formats	DVD-RAM
		DVD+R
		DVD+RW
		DVD+R DL
		DVD-R DL
		DVD-R
	Disc Capacity	DVD-RW
		CD-R
		CD-RW
		DVD-ROM 8.5 GB DL or 4.7 GB standard
		Full Stroke DVD < 240 ms (seek)
		Full Stroke CD < 200 ms (seek)

Technical Specifications - Optical and Removable Storage

Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 40X CD-RW Up to 32X
	DVD ROM Read	DVD-RAM Up to 12X
		DVD+RW Up to 8X
		DVD-RW Up to 8X
		DVD+R DL Up to 12X
		DVD-R DL Up to 12X
		DVD-ROM Up to 16X
		DVD-ROM DL Up to 12X
		DVD+R Up to 16X
		DVD-R Up to 16X
Power	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC \pm 5%-100 mV ripple p-p 12 VDC \pm 5%-200 mV ripple p-p
	DC Current	5 VDC -<1000 mA typical, <1600 mA maximum 12 VDC -<1200 mA typical, <2000 mA maximum
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 90%
	Maximum Wet Bulb Temperature	86° F (30° C)
	Operating Systems Supported	Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11
	Kit Contents	No driver is required for this device. Native support is provided by the operating system. HP SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.

HP Blu-Ray Writer

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA
Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Formats	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R

Technical Specifications - Optical and Removable Storage

Disc Capacity	DVD-RW	
	CD-R	
	CD-RW	
	DVD-ROM	8.5 GB DL or 4.7 GB standard
	Blu-ray	50 GB DL or 25 GB standard
	Full Stroke DVD	< 250 ms (seek)
	Full Stroke CD	< 210 ms (seek)
	Blu-ray	Blu-ray
	Startup Time (Time to drive ready from tray loading)	BD-ROM (SL/DL) 25S / 28S
		BD-R (SL/DL) 25S / 28S
Maximum Data Transfer Rates		BD-RE (SL/DL) 25S / 28S
		DVD-ROM (SL/DL) 18S / 18S
		DVD-R (SL/DL) 25S / 25S
		DVD-RW 25S
		DVD+R (SL/DL) 25S / 25S
		DVD+RW 25S
		DVD-RAM 45S
		CD-ROM 45S
	CD ROM Read	CD-ROM Up to 40X
		CD-R Up to 40X
		CD-RW Up to 40X
	DVD ROM Read	DVD-RAM Up to 5X
		DVD+RW Up to 10X
		DVD-RW Up to 10X
		DVD+R DL Up to 8X
		DVD-R DL Up to 8X
		DVD-ROM Up to 16X
		DVD-ROM DL Up to 8X
		DVD+R Up to 12X
		DVD-R Up to 12X
	Blu-Ray	BD-ROM Up to 6X
		BD-ROM DL Up to 4.8X
		BD-R Up to 6X
		BD-R DL Up to 4.8X
		BD-R Up to 6X
		BD-RE SL/DL Up to 4.8X
Power	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC \pm 5%-100 mV ripple p-p 12 VDC \pm 10%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	15% to 80%
	Maximum Wet Bulb Temperature	86° F (30° C)
	Operating Systems	Windows 7 Professional 32-bit and 64-bit,

Technical Specifications - Optical and Removable Storage

	Supported	<p>Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*.</p> <p>Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, SUSE Linux Enterprise Desktop 10 & 11</p> <p>* No driver is required for this device. Native support is provided by the operating system.</p> <p>** RHEL WS4 not supported on Z200/Z200SFF</p>
	Kit Contents	<p>HP Blue Laser RW Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide.</p>
	Disclaimer	<p>As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.</p>
HP 14-in-1 Media Card Reader	Description	<p>Supports hardware ECC (Error Correction Code) function</p> <p>Supports hardware CRC (Cyclic Redundancy Check) function</p> <p>Supports MS 4-bit parallel transfer mode</p> <p>Supports MS-PRO 4-bit parallel transfer mode</p> <p>Supports MS PRO-HG Duo 4-bit parallel transfer mode</p> <p>Supports SD 4-bit parallel transfer mode</p> <p>Supports UHS-104 SD 4-bit card (version 3.0)</p> <p>Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode</p>
	Interface Type	<p>USB 3.0 High-speed interface</p> <p>Note: If there is a USB2 connection, USB2 transfer speeds are supported.</p>
	Dimensions (WxHxD)	4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm)
	Supported Media Types	<p>CompactFlash Type I</p> <p>CompactFlash Type II</p> <p>Microdrive</p> <p>Secure Digital Card (SD)</p> <p>Secure Digital High Capacity (SDHC)</p> <p>SD Extended Capacity Memory Card (SDXC)</p> <p>Memory Stick</p> <p>Memory Stick Select</p> <p>Memory Stick Duo (MS Duo)</p> <p>Memory Stick PRO (MS PRO)</p> <p>Memory Stick PRO Duo (MS PRO Duo)</p> <p>Memory Stick PRO-HG Duo</p> <p>MagicGate Memory Stick (MG)</p> <p>MagicGate Memory Stick Duo</p> <p>Note: These additional media types are supported with a card adapter.</p> <p>Memory Stick Micro (M2)</p> <p>miniSD</p> <p>miniSD High Capacity</p> <p>Micro SD Memory Card (MicroSD)</p> <p>Micro SD High Capacity Memory Card (MicroSDHC)</p>
	Operating Environmental	10°C 10% R.H. ≥ 24 hours

Technical Specifications - Optical and Removable Storage

(all conditions non-condensing)

10°C 90% R.H. ≥ 24 hours
 20°C 90% R.H. ≥ 24 hours
 30°C 90% R.H. ≥ 24 hours
 40°C 90% R.H. ≥ 24 hours
 50°C 90% R.H. ≥ 24 hours
 50°C 10% R.H. ≥ 24 hours

Extremes:

140°F (60°C) @ 80% R.H. for 96 hours
 -22°F (-30°C) @ 20% R.H. for 48 hours

No power applied

Delta °C < 1.0°C/min

Delta % R.H. < 1.5% R.H./min

Note: Test Parameters/Conditions - Power applied, unit operating on system ±5%

Operating Systems Supported

Windows 8 Pro (64-bit)*
 Windows 8 (64-bit)*
 Windows 7 Ultimate (32-bit)**
 Windows 7 Ultimate (64-bit)**
 Windows 7 Professional (32-bit)**
 Windows 7 Professional (64-bit)**
 Windows 7 Home Basic**
 Windows 7 Home Premium (32-bit)**
 Windows 7 Home Premium (64-bit)**
 Windows Vista Business 64
 Windows Vista Business 32
 Windows Vista Home Basic 32
 Windows XP Professional
 Windows XP Home 32

No driver is required for this device. Native support is provided by the operating system.

Note: Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com>.

Note: Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See <http://www.microsoft.com/windows/windows-7/> for details.

Kit Contents

Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD

Approvals

USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only

HP CMT Handle in Top Optical Bay

Features

- Front panel handle/grip for Z4 and Z2 when loaded in top 5.25" external bay
- Two tool-free 2.5" SFF drive carriers (drives not included)

Dimensions (HxWxD)

42.7 x 149.0 x 205.5 mm

Weight

0.6 kg (1.3 lbs)

Operating Temperature

5° to 35°C (40° to 94°F)

HP 15-in-1 Media Card Reader

Description

Supports hardware ECC (Error Correction Code) function
 Supports hardware CRC (Cyclic Redundancy Check) function

Technical Specifications - Optical and Removable Storage

	<ul style="list-style-type: none"> Supports MS 4-bit parallel transfer mode Supports MS-PRO 4-bit parallel transfer mode Supports MS PRO-HG Duo 4-bit parallel transfer mode Supports SD 4-bit parallel transfer mode Supports UHS-104 SD 4-bit card (version 3.0) Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode
Interface Type	USB 3.0 High-speed interface Note: If there is a USB2 connection, USB2 transfer speeds are supported.
Dimensions (WxHxD)	4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm) Fits conveniently in the 5.25" drive bay.
Supported Media Types	<ul style="list-style-type: none"> CompCompactFlash Type I CompactFlash Type II Microdrive Secure Digital Card (SD) Secure Digital High Capacity (SDHC) SD Extended Capacity Memory Card (SDXC) SD Ultra High Speed II(SD UHSII) Memory Stick Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo MagicGate Memory Stick (MG) MagicGate Memory Stick Duo <p>These additional media types are supported with a card adapter.</p> <ul style="list-style-type: none"> Memory Stick Micro (M2) miniSD miniSD High Capacity Micro SD Memory Card (MicroSD) Micro SD High Capacity Memory Card (MicroSDHC)
Operating Systems Supported	Test Parameters/Conditions - Power applied, unit operating on system $\pm 5\%$ Windows 8 Pro (64-bit)* Windows 8.1 (64-bit)* Windows 8 (64-bit)* Windows 7 Ultimate (32-bit)** Windows 7 Ultimate (64-bit)** Windows 7 Professional (32-bit)** Windows 7 Professional (64-bit)** Windows 7 Home Basic** Windows 7 Home Premium (32-bit)** Windows 7 Home Premium (64-bit)** Windows Vista Business 64 Windows Vista Business 32 Windows Vista Home Basic 32 Windows XP Professional Windows XP Home 32 No driver is required for this device. Native support is provided by the operating system.

Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or

Technical Specifications - Optical and Removable Storage

software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com>.
Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See <http://www.microsoft.com/windows/windows-7/> for details.

Kit Contents Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD

Approvals USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0, Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT

Technical Specifications - Controller Cards

HP IEEE 1394b FireWire PCIe Card	Data Transfer Rate	Supports up to 800 Mbps
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b bilingual 9-Pin Connector (Rear)
	Internal Connectors	One 10-Pin header Custom Connector
	System Requirements	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP Professional, Windows XP Home, Windows Vista, SLED 11 and RHEL 6. Intel Pentium® G series or higher processor, 128-MB RAM, 1-GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	Temperature – Operating	50° to 131° F (10° to 55° C)
	Temperature – Storage	–22° to 140° F (–30° to 60° C)
	Relative Humidity – Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista® Business 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit. Not supported on Linux.
HP Thunderbolt-2 PCIe 1-port I/O Card	Data Transfer Rate	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 128-MB RAM, 1-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	–22° to 140° F (–30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables(2), user documentation and warranty card.
	Warranty	The HP Thunderbolt™ 2 PCIe 1-port I/O Card has a one-year Limited Warranty or the remainder of the warranty of the HP supported product in which it is installed. Technical support is available seven days a week, 24 hours a day, by phone, as well as online support forums. Certain restrictions and exclusions apply.

Technical Specifications - Networking and Communications

Integrated Intel 82579LM PCIe GbE Controller	Connector	RJ-45
	Controller	Intel 82579LM GbE platform LAN connect networking controller
	Memory	24 KB FIFO packet buffer memory
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1P, 802.1Q, 802.2, 802.3, 802.3ab, 802.3az, 802.3u
	Bus Architecture	PCI Express and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V and 1.05V or just 3.3V with integrated regulators
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostic. AMT 7.0 support
<hr/>		
Intel Gigabit CT Desktop NIC	Connector	RJ-45
	Controller	Intel WG82574L Gigabit Ethernet Controller
	Memory	Integrated Dual 48K configurable transmit receive FIFO Buffers
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	Bus Architecture	PCI-E 1.0a
	Data Path Width	X1, 250 MB/s, Bi-directional interface
	Data Transfer Mode	Bus-master DMA
	Hardware Certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
	Power Requirement	Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T
	Boot ROM Support	Yes
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	85% at 131° F (55° C)
	Dimensions	12.1 x 5.7 x 2.0 cm (4.75 x 2.25 x 0.8 in)
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64, Windows Vista Business 32, Windows XP Professional, Windows XP x64. Red Hat Enterprise Linux 4 (RHEL4.8 or newer)*, Red Hat Enterprise Linux 5 (RHEL5.3 or newer), Red Hat Enterprise Linux 6, SUSE Linux Enterprise Desktop (SLED) 11

Technical Specifications - Networking and Communications

		RHEL 4 and 5, SLED 10, are not supported on the Z220 CMT/SFF
Management Capabilities		WOL , PXE, DMI, WFM 2.0
Kit Contents		Intel Gigabit CT Desktop NIC, low profile bracket, CD containing Intel PROset II NIC drivers, quick install guide, product warranty statement
<hr/>		
Broadcom (5761) NetXtreme Gigabit Ethernet Plus NIC	Connector	RJ-45
	Controller	Broadcom 5761 PCI-Express LAN Controller
	Memory	8 MB NVRAM serial Flash
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x
	Bus Architecture	PCI-Express
	Data Path Width	Single Channel PCI-Express
	Data Transfer Mode	Bus Master DMA
	Hardware Certifications	FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682)
	Power Requirement	1.8W @ 3.3V
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex Half-duplex (not available for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	131° F (55° C) with 5% to 95% non-condensing humidity
	Dimensions	7 cm x 10.5 cm (2.75 in x 4.13 in), low profile compatible
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional, Windows XP x64 Red Hat Enterprise Linux (RHEL) 5, 6; Novell SLED 10 & 11
	Management Capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles
	Kit Contents	Broadcom NetXtreme Gigabit Ethernet Plus NIC, Broadcom NetXtreme Gigabit Ethernet Plus NIC USB Cable Assembly, CD, drivers, quick install guide, product warranty statement
<hr/>		
HP 361T PCIe Dual Port Gigabit NIC	Connector	Two RJ-45
	Controller	Intel® Ethernet I350 Controller
	Data Rates Supported	10/100/1000 Mbps, Half- and full-duplex
	Compliance	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950

Technical Specifications - Networking and Communications

	CSA 950
	EN 60950
	CE
	ACPI 1.1a
	Microsoft WHQL (Windows Hardware Quality Labs)
Bus Architecture	PCI-E 1.0a
Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
Operating Temperature	32° to 131°F (0° to 55° C)
Operating Humidity	10% to 95% non-condensing
Dimensions (H x W x D)	5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets)
Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
Management Capabilities	WOL , PXE 2.1
Kit Contents	HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Quick Install Card (QIC).

HP X520 10GbE Dual Port Adapter	Hardware Certifications	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
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HP 10GbE SFP+ SR Transceiver	Operating Temperature	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d)inches (1.19 x 1.38 x 5.57 cm)

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Summary of Changes

Date of change:	Version History:		Description of change:
May 22, 2014	From v36 to v37	Added	Added change log
October 1, 2014	From v37 to v38	Changed	OS offerings, RAID configurations, Supported Components - Memory section,
		Removed	"Creative Recon3D" audio card